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VIA HAND DELIVERY

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FEDERAL COMMUNICATIONS COMMISSION  
OFFICE OF THE SECRETARY

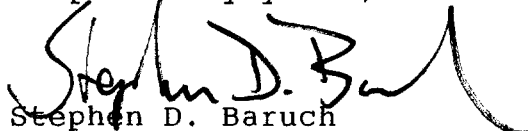
Re: TRW Inc. Petition for Rule Making  
and Request for Pioneer's Preference

Dear Ms. Searcy:

On behalf of TRW Inc. ("TRW"), please find enclosed the original and four copies of its Petition for Rule Making and Request for Pioneer's Preference. TRW is requesting that the Commission amend Sections 2.106 and 25.141 of its Rules to allocate spectrum for, and to establish other rules and policies pertaining to, satellite systems in the 1610-1626.5 MHz and 2483.5-2500 MHz bands.

Please direct any questions concerning this matter to the undersigned.

Respectfully yours,

  
Stephen D. Baruch

SDB:sak  
Enclosures  
cc: Attached List (w/encl.)

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BEFORE THE  
**Federal Communications Commission**  
WASHINGTON, D.C. 20554

In the Matter of

Petition of TRW Inc. for Amendment  
of Sections 2.106 and 25.141 of the  
Commission's Rules to Allocate  
Spectrum for, and to Establish Other  
Rules and Policies Pertaining to,  
Satellite Systems in the RDSS Bands

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FEDERAL COMMUNICATIONS COMMISSION  
OFFICE OF THE SECRETARY

PETITION FOR RULE MAKING AND  
REQUEST FOR PIONEER'S PREFERENCE

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July 8, 1991

Counsel for TRW Inc.

## SUMMARY

In this Petition, TRW Inc. ("TRW") requests the Commission to make certain changes to its rules to accommodate the provision of spread spectrum mobile satellite voice and data communications in the 1610-1626.5 MHz and 2483.5-2500 MHz bands (the "RDSS bands"). Specifically, TRW proposes that the Commission revise its rules in the following manner: (1) to allow the provision of spread spectrum mobile satellite voice and data services that are technically compatible with radiodetermination satellite services ("RDSS") in the RDSS bands; (2) to modify the power flux density limits in the 2483.5-2500 MHz band to accommodate the provision of Mobile-Enhanced RDSS ("M-E RDSS") service; and (3) to allocate 220 MHz of spectrum -- 110 MHz each in the 19.7-20.2 GHz and 29.5-30.0 GHz bands -- for M-E RDSS feeder links.

TRW demonstrates that grant of its rulemaking proposal will advance the public interest in several key respects. First, it will enable the Commission to realize many of the policy objectives it identified in establishing the RDSS service in 1986. Although "pure" RDSS systems are not currently economically viable propositions, there is no reason why RDSS services cannot be provided on a technically compatible basis with spread spectrum mobile voice and data services. TRW's proposal to ease the power flux density limits in the 2483.5-2500 MHz band will allow for a doubling of the capacity of spread spectrum systems operating in those bands

without causing harmful interference to existing terrestrial systems, and TRW's requested frequencies in the Ka-Band are particularly appropriate for feeder link allocations for the M-E RDSS. Finally, TRW's proposal is fully consistent with the Commission's longstanding policy objective of fostering competitive multiple entry in the satellite arena in general -- and in the RDSS bands in particular.

To implement the M-E RDSS service, TRW urges the Commission to apply the existing licensing rules and policies (except for those changes requested in the Petition) for the RDSS service. This will greatly expedite initiation of the service, and will enable the Commission to avoid having to address the several pending requests for waiver of the construction permit requirement of Section 319(d) of the Communications Act.

TRW also requests a pioneer's preference for its Odyssey system on the basis of its proposal substantially to enhance the use of the RDSS bands. The addition of spread spectrum mobile voice and data authority to these bands greatly expands the use of the spectrum, and TRW's Odyssey system satisfies every one of the Commission's criteria for awarding pioneer's preferences.

TRW urges the Commission to expedite its consideration of TRW's proposal for the establishment of the M-E RDSS.

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**PETITION FOR RULE MAKING AND  
REQUEST FOR PIONEER'S PREFERENCE**

FEDERAL COMMUNICATIONS COMMISSION  
OFFICE OF THE SECRETARY

TRW Inc. ("TRW"), by its attorneys and pursuant to Section 1.401 of the Commission's rules, hereby petitions the Commission to amend Sections 2.106 and 25.141 (formerly Section 25.392) of its rules, 47 C.F.R. §§ 2.106 and 25.141, in the respects set out below, in order to allow the introduction of spread spectrum mobile voice and data services into the radiodetermination satellite service ("RDSS") frequency bands for the provision of Mobile-Enhanced Radiodetermination Satellite Service ("M-E RDSS").

**I. Introduction**

TRW requests the Commission to revise its rules (1) to state that spread spectrum mobile satellite voice and data services that are technologically compatible with radiodetermination satellite services may be provided in the

1610-1626.5 MHz (uplink) and 2483.5-2500 MHz (downlink) bands ("the RDSS bands"); (2) to relax modestly the current power flux density limitations in the 2483.5-2500 MHz band to accommodate spread spectrum mobile voice and data transmissions; and (3) to allocate 110 MHz each in the 19.7-20.2 GHz and 29.5-30.0 GHz bands for spread spectrum mobile service feeder links. TRW also requests the Commission to grant it a Pioneer's Preference, pursuant to the Report and Order in Gen. Docket No. 90-217, FCC 91-112 (released May 13, 1991), in connection with its proposal to construct the "Odyssey" system -- which represents a substantial enhancement of the current radiodetermination satellite service -- to operate in the requested frequency bands.

Over the last several years, the state of technological development has advanced to the point where it is economically and technically practicable to provide mobile satellite voice and data services that are compatible with the RDSS "baseline" that the Commission established in the mid-1980s. In addition, it is now clear, with the recent failure of the last remaining permittee of a "pure" RDSS system, that the establishment of a satellite system for the provision of "pure" RDSS services is not presently an economically-viable proposition. Seizing upon these two developments, TRW has proposed an innovative satellite system

that will provide the RDSS services contemplated by the Commission when it established that service, and also enhance greatly the utilization of the RDSS bands by providing fully compatible mobile voice and data satellite services for which there is tremendous untapped demand.

Because TRW's Odyssey system will be able to be used for the provision of voice and data services that are compatible with the Commission's current RDSS allocation, TRW does not seek a specific new frequency allocation for the RDSS bands. Instead, TRW seeks amendments to Sections 2.106 and 25.141 of the Commission's rules that will serve to allow satellite system operators to provide spread spectrum mobile voice and data services -- in addition to RDSS services -- in the RDSS bands. TRW contemplates that the change to Section 2.106 can be accomplished by way of a new or revised footnote to the U.S. Table of Allocations.

In this regard, TRW observes that in its recent Report in GEN Docket No. 89-554, the Commission proposed to recommend to the 1992 World Administrative Radio Conference that MSS and RDSS be added to the 1610-1626.5 MHz (earth-to-space) and 2483.5-2500 MHz (space-to-earth) bands on a primary basis in all three International Telecommunication Union regions. An Inquiry Relating to Preparation for the International Telecommunication Union World Administrative Radio Conference

for Dealing with Frequency Allocations in Certain Parts of the Spectrum, FCC 91-188, slip op. at ¶ 42 (released June 20, 1991) ("WARC-92 Report"). In order to effect its proposed changes to the RDSS bands, the Commission proposed "to add footnote 733Z to permit MSS to be introduced in these bands in accordance with CCIR Recommendations to ensure compatibility with RDSS . . . ." Id.

TRW's M-E RDSS proposal is fully consistent with the Commission's primary frequency allocations in the RDSS bands as proposed in its WARC-92 Report. Under TRW's proposal, as under the Commission's, mobile services may be introduced in the RDSS bands, but only so long as they are compatible with spread spectrum RDSS services. Moreover, the fact that the Commission is again proposing a global, primary RDSS allocation is hard evidence of its continuing commitment to the public interest benefits to be achieved upon the introduction of RDSS services.

With the changes TRW is requesting to Sections 2.106 and 25.141(d) of the Commission's rules, along with the easing of the power flux density limitations imposed upon RDSS downlink transmissions in the 2483.5-2500 MHz band, it will not be necessary for the Commission to promulgate new basic qualifications criteria or service rules and policies for the M-E RDSS service. Thus, the Commission will be able simply to

apply the rules and policies it established in its RDSS Licensing Order<sup>1/</sup> to the M-E RDSS service.

The relative simplicity of TRW's proposal, and its consistency with the Commission's proposals for frequency allocations at WARC-92, greatly reduce the amount of effort the Commission will have to expend in order to establish the proposed service. In recognition of these savings, TRW respectfully requests the Commission to expedite consideration of its petition. Expedited consideration of this request will have the beneficial side effect of obviating the need for the Commission to rule on the several outstanding requests for waiver of the construction permit requirements of Section 319(d) of the Communications Act, and thereby further conserve Commission reserves.

## **II. Description Of TRW's Odyssey System.**

TRW has been a pioneer and leader in space technology for more than 30 years. It has built more than 175 scientific, defense and commercial communication satellites.

On May 31, 1991, TRW applied for authority to construct a satellite system -- "Odyssey" -- for the provision

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<sup>1/</sup> Amendment of the Commission's Rules to Allocate Spectrum for, and to Establish Other Rules and Policies Pertaining to, a Radiodetermination Satellite Service, Second Report and Order, 104 F.C.C.2d 650 (1986) ("RDSS Licensing Order").

of radiodetermination, and mobile voice and data communications satellite services. TRW's Odyssey system will consist of 12 satellites, four each in three orbital planes, that will operate in medium Earth orbit at altitudes of 5,600 nautical miles.

Initially, Odyssey will be able to provide communications links between mobile and fixed users, or between pairs of mobile users, everywhere in the United States (including Hawaii, Alaska, and Puerto Rico), and almost anywhere in North America. With the addition of gateway earth stations around the world, Odyssey's twelve satellites will be able to provide virtually global coverage.

Odyssey will revolutionize the use of the RDSS bands by providing not only radiolocation and radionavigation services to users on land, at sea, and in the air, but also by making capacity available for cellular telephone and mobile data services on a universal-access basis. Odyssey will enhance the utilization of the RDSS bands in this manner, and its mobile voice and data services will have a positive impact on the cellular radio industry by expanding system coverage into areas and markets that are not presently open to terrestrial cellular systems for economic or technical reasons.

Mobile users of the Odyssey system will access the system via inexpensive hand-held transceivers that will operate

with as little as 0.5 Watt of transmitted power. Each subscriber will have access to at least two Odyssey satellites at all times. Spectrum efficiency is promoted by the fact that Odyssey's multi-cell beam configuration reuses the spectrum 6.3 times.

TRW's Odyssey system employs code division multiple access ("CDMA") spread spectrum modulation techniques in both the RDSS band uplinks and downlinks. TRW's proposal to provide spread spectrum mobile voice and data services in the RDSS bands, in addition to radiodetermination services, is a significant and innovative new use of these bands, as the provision of co-primary mobile voice and data services is not specifically authorized.<sup>2/</sup> Nevertheless, the spread spectrum mobile voice and data services to be provided via Odyssey -- with the exception of the power flux density limitations on S-Band RDSS transmissions -- are compatible with the RDSS standards promulgated by the Commission in its RDSS Licensing Order.

In sum, by combining mobile voice and data service capability onto a satellite system that will generally be compatible with the Commission's RDSS rules and policies, TRW's Odyssey system stands poised to deliver a number of benefits to the public. These benefits are described in detail in TRW's

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<sup>2/</sup> See 47 C.F.R. § 25.141(d) (1980).

Odyssey system application (which is hereby incorporated by reference), and include the following:

- Radiolocation, voice and data services to mobile users in all 50 states and U.S. territories, much of Canada and virtually all of Mexico;
- Low communication time delay compared to geostationary satellites to facilitate interactive voice communications;
- High elevation angles to minimize obstruction by trees, buildings and terrain shadowing; and
- Inexpensive service to underserved segments of society, including emergency service providers, farmers and ranchers, truckers and travellers in rural areas, and ships and airplanes.

Through its Odyssey system, TRW thus offers an innovative communications satellite system that will greatly enhance the efficient use of the RDSS bands.

**III. Inclusion Of Spread Spectrum Mobile Voice And Data Services In The RDSS Bands Will Advance The Public Interest.**

**A. "Pure" RDSS Systems Are Not Presently Economically Viable.**

Originally, the Commission anticipated that there would be strong market demand for "pure" RDSS services -- i.e., for radiolocation and radionavigation services provided by dedicated satellite systems. In order to ensure that there was

sufficient spectrum available for the provision of RDSS service to the public, the Commission set aside the 1610-1626.5 MHz and 2483.5-2500 MHz frequency bands for RDSS service only. Another Commission goal was to ensure that RDSS service was provided to the public at the lowest cost, and as soon as possible. Thus, the Commission set up a licensing program that was designed to ensure competitive multiple entry into the new RDSS service, but also avoid the delays associated with the comparative evaluation of mutually exclusive applicants.<sup>3/</sup>

Since 1986, however, the marketplace has undergone considerable change. All but one of the original RDSS licensees have relinquished their authorizations, and the only remaining licensee -- Geostar -- is presently being liquidated in bankruptcy. Thus, the current situation demonstrates that a "pure" RDSS system is not economically viable.

Clearly, the frequencies that had been set aside for RDSS only are not being adequately or efficiently used. It would be far more efficient for the Commission to allow use by spread spectrum mobile voice and data services as well as radiodetermination services, thereby greatly enhancing the use of the spectrum.

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<sup>3/</sup> RDSS Licensing Order, 104 F.C.C.2d at 653.

**B. Spread Spectrum Voice And Data Services May Be Provided Compatibly With RDSS Services In The RDSS Bands.**

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**1. The State Of The Art Has Advanced Over The Last Six Years.**

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In its RDSS Licensing Order, the Commission restricted use of RDSS bands to RDSS only. It believed, based on the record before it, that any use of the bands for mobile voice or data services would be incompatible with RDSS, and that the service restriction imposed in Section 25.392(d) (now Section 25.141(d)) was necessary to protect the perceived vital nature of radiodetermination services. The Commission, however, left open the possibility that it would subsequently permit the introduction of voice services in the RDSS bands.<sup>4/</sup> The principal reason the Commission did not consider this possibility at the time was its determination "that the two services were distinct and involved different technologies."<sup>5/</sup>

In recent years, significant technological advances in digital voice compression have occurred which allow for improved speech transmission via low data rates. Many more channels can be transmitted through the same bandwidth and power associated with RDSS. Thus, TRW's Odyssey system, which

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<sup>4/</sup> RDSS Licensing Order, 104 F.C.C.2d at 658.

<sup>5/</sup> Id.

uses CDMA signaling techniques, can provide voice services in a spectrum efficient manner that was not possible just a few years ago.

The digitized voice transmissions of the Odyssey system minimize the technical distinction between voice and data signals. RDSS and mobile voice and data signals are provided compatibly via the Odyssey system, using allocated spectrum similarly and increasing service options for the system's users. As a result, the system maintains remarkable spectrum efficiency, and there is minimal risk of RDSS being compromised by voice service on the Odyssey system.

**2. Modest Relaxation Of Current Power Flux Density Limitations Will Have Minimal Impact On Existing Fixed Service Users At S-Band.**

In order to establish voice service in the RDSS bands, it will be necessary to ease slightly the current power flux density limitations in the S-Band (2483.5-2500 MHz) to accommodate spread spectrum voice downlink transmissions. Neither TRW, nor any of the other applicants proposing to offer spread spectrum mobile voice services in the S-Band, conform to the established power flux density requirement.<sup>6/</sup> However,

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<sup>6/</sup> TRW has recognized that, even with the possibility of real time control of power flux density, its Odyssey system will most likely occasionally violate the S-Band

easing the limits -- at least in the United States -- should have little or no effect on established users of the RDSS spectrum.<sup>1/</sup>

As reported in the Attachment to this Petition, the power flux density limits can be eased by at least 10 dB without causing harmful interference to existing terrestrial systems operating in the relevant S-Band frequencies.

Attachment at 4 (citing Assessment of Satellite Power Flux-Density in the 2025-2300 MHz Frequency Range, Part II,

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(Footnote continued from previous page)

<sup>6/</sup> power flux density limits. It requested a limited waiver of the limits. Odyssey Application at Appendix C. Constellation Communications, Inc. states that its proposed Aries system cannot meet the current S-Band power flux density limits and will either require a waiver of the limit or additional spectrum to serve 50 users simultaneously. See Aries Application at Appendix H, p.2. Loral Cellular System Corp.'s proposed Globalstar system also exceeds the power flux density limits. See Globalstar Application at Part II, p. 177. In Exhibit I to Ellipsat Corporation's Ellipso II application, Ellipsat lists its satellites as having an EIRP of 22 dBW for each 1.4 MHz spread spectrum signal. From an apogee of 2903 kilometers, these parameters just meet the power flux density limit. Although Ellipsat does not state the lowest operational altitude of its satellites, it does note that "duration of illumination of the United States is up to 37 minutes." Ellipso II Application at 25. Assuming that Ellipso II satellites will transmit for 18.5 minutes on either side of apogee, then the satellites' operational altitude will be more than 10 percent lower than apogee, and they will exceed the power flux density limit.

<sup>1/</sup> International compliance with the power flux density limitations at S-Band can be accommodated on an ad hoc waiver basis.

NTIA Report No. 84-152 (1984)). Moreover, with this slight relaxation of the limits, the number of simultaneous users that can be accommodated in any single coverage beam will be two times the number than can be accommodated within the current limit. Of course, with multibeam systems such as Odyssey, the number of additional users that can be gained through the relaxation of the S-Band power flux density limits requested here increases substantially. Attachment at 2-3.

**C. TRW's Rulemaking Proposal Is Consistent With The Commission's Goals And Offers A Way For The Commission To Revitalize The RDSS Service.**

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TRW's rulemaking proposal offers a regulatory alternative that is both faithful to the Commission's original objectives for the RDSS service, and capable of expedient implementation. It will lead to uses of the RDSS bands that are economically viable, and will allow innovative uses of the RDSS bands in a manner that achieves the Commission's original objectives for the RDSS service without compromising the integrity thereof. Moreover, as recited above, TRW's M-E RDSS proposal is fully consistent with the Commission's recent RDSS-band proposals for WARC-92 -- proposals for primary frequency allocations to RDSS and MSS that, by their very existence, reaffirm the Commission's continuing commitment to the public policy objectives associated with the RDSS service.

See WARC-92 Report, FCC 91-188, slip op. at ¶ 42 (released June 20, 1991).

In specific, TRW's proposal to require the employment of spread spectrum modulation in the RDSS bands is fully consistent with the Commission's longstanding policy -- particularly prominent in the satellite field -- favoring competitive multiple entry. The Commission has consistently held that allowing competitive multiple entry for emerging satellite technologies best promotes the public interest.<sup>8/</sup> In the past, when it has been faced with a decision between allocating spectrum for a service that would employ pro-competitive spread spectrum technology and allocating spectrum for a less efficient proposal that would reduce the spectrum available for competing systems, it has found that the utilization of spread spectrum technology that fosters competitive multiple entry is most consistent with the public interest.<sup>9/</sup>

TRW's proposal to require use of CDMA spread spectrum modulation will promote competitive multiple access to the RDSS bands by making possible the sharing of these frequencies with other spread spectrum RDSS and mobile voice and data satellite

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<sup>8/</sup> See, e.g., Domestic Communications Satellite Facilities, 22 F.C.C.2d 86 (1970); 35 F.C.C.2d 844, recon. in part, 38 F.C.C.2d 665 (1972).

<sup>9/</sup> See RDSS Licensing Order, 104 F.C.C.2d at 660-663.

service providers. By encouraging multiple entry, the Commission creates an environment that provides consumers with the opportunity to choose among competing service providers. This market pressure not only encourages competitors to lower the price of their services in order to gain a greater share of the market -- and therefore offer services in the most efficient manner -- but also encourages them to be more responsive to the consumers' needs.<sup>10/</sup> Competition thus benefits the public interest by encouraging service providers to maintain or improve the quality of their services, and efficiently provide communication services to the public.

The public will therefore benefit -- through improved safety services, business efficiency, and productivity -- from the availability of RDSS services as well as the many other innovative and beneficial services of voice and data transmissions. The public will also benefit from having the choice of service providers that competitive multiple entry encourages. These spectrum and competitive efficiencies will revitalize the RDSS service.

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<sup>10/</sup> Establishment of Satellite Systems Providing International Communications, 101 F.C.C.2d 1046, 1065 (1985) (subsequent history omitted).

**D. Existing RDSS System Licensing Rules And Policies Could Be Applied To Applicants For The M-E RDSS Service, Thereby Accelerating The Establishment Of The Service.**

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One appeal of TRW's regulatory approach that cannot be overlooked in this era of increasing international competition in the development and implementation of new technology is the fact that TRW's proposal will enable the Commission to accelerate the establishment of the M-E RDSS service. By enhancing the RDSS service through the inclusion of compatible spread spectrum mobile voice and data services, the Commission will be able to avoid the effort required to develop from scratch the application and licensing rules and policies that new services require. Instead, it can simply determine that the basic qualifications criteria adopted in the RDSS Licensing Order are applicable to the current applicants for the new M-E RDSS.

As a result of such a determination, the Commission would apply Section 25.141 -- as modified in the manner requested herein -- to the applications now pending for the RDSS bands. Thus, there would be no need to develop a new financial qualifications standard; the Commission's previous determination that RDSS services may be provided on a non-common carrier basis would be extended to the enhanced RDSS service; and the principles of open entry that are already in

place would continue in effect. It is TRW's position that there is no need for the Commission to distinguish between geostationary and non-geostationary operators in the bands, as the technical compatibility requirements would apply with equal vigor to each.

One additional advantage will accrue from the time savings associated with the application of the existing RDSS licensing policies and rules to the applicants for the new M-E RDSS. Because the Commission will be able to expedite its consideration of the rulemaking proceeding, and thereby accelerate the establishment of the service, it will be unnecessary for the Commission to expend the resources that would otherwise be required to address the several requests that are pending from RDSS-band applicants for waivers of the construction permit requirement of Section 319(d) of the Communications Act of 1934, as amended, 47 U.S.C. § 319(d).<sup>11/</sup> Not only will Commission resources be saved, the final decision on the various proposals now pending before the Commission will be unclouded by prior Commission- or Staff-level interlocutory actions on certain facets of an applicant's proposed system. This last consideration is particularly important for a

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<sup>11/</sup> Requests for Section 319(d) waivers were filed by Motorola Satellite Communications, Inc. and Loral Cellular Systems Corp.

technologically innovative service, such as the M-E RDSS, where several different technical proposals are pending.

**IV. The Commission Should Allocate 220 MHz Of Spectrum In The Ka-Band For M-E RDSS Service Feeder Links.**

TRW urges the Commission to allocate 110 MHz of spectrum in the 29.5-30.0 GHz and 110 MHz of spectrum in the 19.7-20.2 GHz bands to the new M-E RDSS service for earth-to-space and space-to-earth feeder links. Both band segments are currently allocated to the fixed-satellite service on a primary basis, and to the mobile-satellite service on a secondary basis. TRW's requested M-E RDSS feeder link allocations should be given co-primary status with the fixed-satellite service.<sup>12/</sup>

The band segments selected by TRW are particularly appropriate for allocation to the new M-E RDSS. Both segments are currently allocated on a secondary basis for mobile satellite use, and RDSS is, in the generic sense at least, a mobile service. In its comments on the application filed by Motorola Satellite Communications, Inc. ("Motorola") -- an application that included a request for 200 MHz of Ka-Band spectrum for feeder links -- the Communications Satellite

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<sup>12/</sup> In this regard, TRW observes that the Commission's rules currently provide that the fixed-satellite service bands may be used for RDSS feeder links. See 47 C.F.R. § 25.202(a)(2).